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PREVIEW

GAMING-SIMULATION IN THE COLLEGE CLASSROOM: AN ASSESSMENT OF QUAGMIRE, A RECREATION RESOURCE MANAGEMENT GAME

A THESIS
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY
DANIEL LEROY DUSTIN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

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DEDICATION

to my parents,
Lucille F. and Derby D. Dustin,
who devoted their careers to the education of youth

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D.L.D.

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CHAPTER I

INTRODUCTION

Background and Need for Study

In 1972, the Conservation Foundation published National Parks for the Future, a work reflecting on the first one hundred years of the National Park System in the United States and recommending new management strategies for the future. Included among the book's proposals was a call for greater citizen involvement in national park planning processes. This recommendation reflected both an acknowledgement of the public nature of the national parks and a corresponding democratic responsibility on the part of citizenry to participate actively in planning dialogue.

Meaningful public involvement in the planning process requires a basic understanding of a combination of factors which influences national park management. This is especially so with respect to the "preservation versus use" issue which frequently is reflected in day to day management problems. The cultivation of such basic public understanding is a formidable challenge. It necessitates the development of a communication mode that is conducive to presenting a multiplicity of contrasting and often conflicting viewpoints about national park management in a manner that is comprehensible to the public at large. QUAGMIRE, a recreation resource management game, was designed by this writer as a response to this challenge.

QUAGMIRE is a manually operated gaming-simulation that has been developed over the last two years to assist in the analysis of the "preservation versus use" issue as it relates to the management of

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the national parks of the United States. It is largely a role-playing exercise in which pressure groups representing conflicting points of view attempt to persuade a managing authority to respond to certain national park management proposals in a manner that will further their own interests. Action revolves around issues of park use and development with simulated public hearings constituting the forum for game dialogue(See Appendix I for a complete game description.).

The specific objectives of QUAGMIRE as an educational tool are four-fold. First, it was constructed to act as a catalyst for promoting dialogue about the problems confronting National Park Service decision-makers. Second, it was developed to project a view of national park use and management to participants. Third, it was designed to extract opinions from players about national park management. And fourth, it was created to motivate participants to expand their knowledge of national park management concerns(patterned after Duke, 1974).

Although QUAGMIRE has been evaluated informally in terms of these educational objectives, no systematic attempt had been made previous to this study to assess its overall educational value. The need for such an undertaking was evident if QUAGMIRE was to be considered seriously as a tool for teaching about national park management problems. Potential users of the game ought to have access to reliable information indicating its strengths and weaknesses as an environment for learning. This study was an effort to provide such information.

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Purpose of Study

The purpose of this study was to assess the effectiveness of QUAGMIRE, a recreation resource management game, as an educational tool for the college classroom. The research method chosen for this purpose was an experiment consisting of two treatment groups, each playing QUAGMIRE under different experimental conditions. The game's effectiveness was assessed by recording students' cognitive and affective responses to their respective gaming experiences and then comparing results between treatment groups. In addition, selected student characteristics were compared with study outcomes for possible relationships.

Research Hypothesis

The principal research question addressed in this study regarded the impact of incongruence between a student's expressed attitudes about national park use and management and the attitudes assigned to him via his game role on the effectiveness of QUAGMIRE for the student. This question was stated in the form of a null hypothesis for testing purposes: incongruence between a student's expressed attitudes about national park use and management and the attitudes assigned to him in his game role will have no significant impact on the effectiveness of QUAGMIRE for the student.

In addition, a student's sex, class standing, gradepoint average, gaming-simulation experience, and educational orientations were compared with experimental outcomes for possible associations.

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Assumptions

Four assumptions regarding student participation were made in conducting this experiment and in analyzing its results.

1. It was assumed that all of the students responded conscientiously to the preliminary background information request.
2. It was assumed that all of the students completed the assigned readings which were defined as part of the game.
3. It was assumed that all of the students replied candidly to the game evaluation form.
4. It was assumed that all of the students gave a maximum effort on the achievement test which was administered upon conclusion of the experiment.

Limitations and Delimitations

QUAGMIRE was designed for a general, adult audience. All of its testing and refinement, however, has been accomplished with the assistance of university students. The research reported here also is limited to the experiences of university players with QUAGMIRE. Although this presented problems in terms of generalizing the research findings to settings outside of the college classroom, the study was viewed, nonetheless, as a potentially worthwhile contribution to both the development of QUAGMIRE and to the growing body of gaming-simulation literature.

The experimental results are limited further to data gathered from 44 undergraduate and graduate students majoring in Recreation and Park Administration at the University of Minnesota(Twin Cities

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campus) who were enrolled in REC 5-160, Conservation of Natural Resources, Winter Quarter, 1977. The study group was composed initially of 48 students. Four of the students, however, were unable to attend all of the experimental sessions, which reduced the total number of usable cases to 44.

Information obtained from these individuals is limited to pre-experimental questionnaire responses and attitude scale scores, and post-experimental questionnaire responses, attitude scale scores, and achievement test scores. These data were examined using appropriate analyses included in The Statistical Package for the Social Sciences(Nie, Hull, Jenkins, Steinbrenner, and Bent, 1970).

The scale of this study was intentionally small. The research effort was viewed as exploratory in nature, and because of this it was considered important to stay close to the data. The sample size was thought to be large enough to test the null hypothesis, yet small enough to neglect minor treatment effects(Issac and Michael, 1971).

Definition of Terms

The following definitions are included to facilitate an understanding of the study.

1. Gaming-Simulation: ". . .a role playing exercise which focuses on a given setting and a related set of problems or issues. Participants(players) are assigned roles representing conflicting points of view or objectives. Most often, the goal for each player is to obtain control of--

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or a large share of--the limited resources(money, land, power, success, etc.) which are available. The overriding purpose for the simulation as a whole is to depict vividly the behavior patterns and related coping strategies implied by the various roles, individually and collectively"(Kibel, 1972).

2. Debriefing: the final phase of a gaming-simulation which entails a critique of the game and its relationship to the real world analogue.
3. Scenario: "plot outline and setting of game"(Duke, 1974).
4. Role: "character assigned to someone with prescribed pattern of behavior"(Duke, 1974).
5. Cross-Pressuring: "places the player in a situation such that any of several available decisions will have negative impact on his position"(Duke, 1974).
6. Gaminess: "a quality of liveliness that makes a game enjoyable to players"(Duke, 1974).
7. Frame Game: "a game whose procedures are consistent from run to run, but into which new content, subject matter and data can be loaded and calibrated for a new purpose each time it is played"(Duke, 1974).
8. Effectiveness: the capability of QUAGMIRE to teach about national park management problems as evidenced by students' cognitive and affective responses to their gaming experiences.

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CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

Although gaming-simulation has been considered an important teaching tool for centuries(Monroe, 1968), it is only in the last few years that it has been viewed seriously as an educational approach for the college classroom(Boocock, 1968). This new interest in gaming as a meaningful activity for higher education has followed closely the development of the computer. With the assistance of such technology, it has become more feasible to design gaming-simulations which are sophisticated enough to be useful as analogues of real world patterns of interaction and interrelationship. The recent proliferation of such computer-assisted games, and the increasing number of manually operated games as well, provide evidence of their growing recognition as legitimate instructional devices.

The appeal of gaming-simulation to users stems from its apparent strengths as an environment for learning(Moore and Anderson, 1969). Kibel(1972), for example, noted nine such strengths in a paper on gaming as a medium for investigating urban-related issues:

1. Games are fun to play--if designed properly, and hence are sources of pleasure to the students.
2. Games allow the student to be an active participant in the learning experience, rather than a passive member of an audience.
3. Because the student is immersed in the game and its data and rules, he discovers an immediacy and relevancy which

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often escapes him in books and lectures.

4. The student finds himself using the data and the rules, rather than merely hearing about how they can be used.
5. It is easier to remember data and information which is used than that which is merely committed to memory.
6. Games encourage intellectual initiative by yielding game rewards to the innovative student, while penalizing the conservative, unaggressive student.
7. Games require the student to learn how to organize information for achieving immediate game objectives.
8. Games encourage creative and conscientious solutions to problems.
9. Games teach students how to communicate with one another and work together for mutual gains.

Although the empirical foundation for Kibel's claims is relatively weak, recent games research that has been reported has been largely supportive of such thinking(Greenblat, 1975).

Theoretical support for gaming-simulation as a teaching tool is rooted in many areas. Bruner(1966), for example, has pointed out the value of gaming as a socializing process. Through games, people can try out a variety of problem-solving strategies without fear of severe consequences should an unproductive strategy be adopted. In this sense, gaming-simulation can serve a preparatory function for later real life situations.

A second body of thought supportive of gaming-simulation as an educational approach concerns ". . .the importance of group

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dynamics, peer learning, and peer pressure in the learning process." (Greenblat, 1975). This perspective has evolved principally from the work of Coleman(1961), and it emphasizes the value of student interaction as an integral part of the educational experience.

Finally, theories which stress the importance of activity in the learning process also have been utilized to explain the teaching power of gaming-simulation(Greenblat, 1975). Proponents of such orientations suggest that cognition can follow action(Coleman, 1972). Traditional educational approaches, in contrast, have emphasized the idea of information transmission followed by cognition(Greenblat, 1975). The empirical bases of both propositions are limited, however, and they remain hypotheses warranting more investigation.

The disadvantages of gaming-simulation as a teaching tool also have received attention in the literature. Most notable among them are the time and cost involved in game construction(Duke, 1974), the fact that games have little predictive power with respect to making real world decisions based on game outcomes(Feldt, 1966), and, perhaps most importantly, the fact that there is little empirical evidence to date documenting what impressions players take away from gaming experiences(Rosenfeld, 1975).

The remaining sections of this literature review focus on the last disadvantage mentioned as it relates to claims made about the educational effectiveness of gaming-simulation. Specifically, claims about cognitive learning, affective learning, and motivation and interest are reviewed. In addition, a summary of methodologi-

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cal difficulties inherent in games research is presented as a preface to the discussion of procedures employed in the present study.

Cognitive Learning

The effectiveness of gaming-simulation as a vehicle for cognitive learning has been questioned repeatedly. While enthusiasm for gaming in this respect has been high on the part of those closely involved with game design and use, evidence to support such enthusiasm has been largely anecdotal(Greenblat, 1975). Of the empirical efforts that have been made, several contradictory results have been reported. Emery and Enger(1972), for example, found that a computerized game used to teach introductory economics was related to gains in student achievement. Wentworth(1972), on the other hand, reported that students who participated in another economics game scored significantly lower on a follow-up test than did students who learned about the same subject matter through a conventional teaching method. Similar inconsistencies in study outcomes were found throughout the literature.

Several explanations for this conflicting evidence have been offered. Frequently, such explanations have been based on perceived inadequacies in the research methods employed. Raser(1969) noted that measures of learning often were constructed to assess the acquisition of factual information, while gaming-simulations were developed to teach concepts and relationships. Shirts(1970) also underscored this methodological shortcoming in a discussion of the discrepancy between research findings and the expectations

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of those knowledgeable about game design and use. He pointed out that information which was presented in a straightforward, sequential manner in books and lectures, often was hidden in game scenarios and in communications among players. Consequently, according to Shirts, it was unrealistic to expect the same kind of learning from gaming-simulation as was expected from traditional educational approaches. And tests which were designed to assess learning resulting from traditional teaching methods were inappropriate for the assessment of cognitive learning through gaming-simulation.

Fletcher(1971) argued that the inconclusive state of games research regarding cognitive learning could be explained partially by the failure of researchers to consider player characteristics which might be associated differentially with learning effects. He suggested that future game evaluations include tests of association between such player characteristics and cognitive outcomes to determine which kinds of players learn more through the gaming mode.

Central to Fletcher's argument is the thought that gaming-simulations do not possess unique qualities which make them highly effective for all types of people. A recent study by De Nike(1976), relating the learning effectiveness of an educational game to players' cognitive styles, supports Fletcher's contention.

In addition to problems of research design, the heterogeneity of games also has been pointed out as an obstacle to generalizing about their efficacy as environments for cognitive learning. A large variation in game content and style has made it difficult to transfer statements made about the teaching ability of one game to

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another. The implication of this problem for research is that it may be necessary to evaluate the learning effectiveness of gaming-simulations on an individual basis rather than attempting to test hypotheses about games in general.

In summary, this portion of the literature search revealed an uncertain relationship between gaming-simulation and cognitive learning. Inconsistent research findings were attributed to faulty measurements, neglect of player characteristics which might be associated differentially with learning outcomes, and the heterogeneous natures of games which hinder generalizations about learning efficacy from game to game. Thus, claims about the educational effectiveness of gaming-simulation as a vehicle for cognitive learning were not found to be supported by a large body of rigorous research. It also should be noted, however, that there was no substantial evidence uncovered which proved gaming-simulation to be less effective in this respect than traditional teaching methods.

Affective Learning

Cognitive learning is one kind of outcome of a gaming-simulation experience. Affective learning, or feelings about the gaming-simulation and its contents, is another. While the cognitive outcomes of educational games are of obvious importance, affective outcomes also are meaningful for assessing the overall effectiveness of gaming as an educational medium.

It is reasonable to expect that playing the role of another individual in a gaming-simulation might lead to a greater degree

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of empathy for that individual and to an increased understanding of his problems(Rosenfeld, 1975). Robinson(1966), in a study of the INTER-NATION SIMULATION, found this to be the case. Boocock (1967) also reported similar results in an investigation of the LIFE CAREER game, as did Livingston and others(1973) in an assessment of DEMOCRACY. Such findings suggest that gaming-simulation can have a pronounced attitudinal impact on participants.

Boocock(1967) has pointed out that if gaming-simulation can change player attitudes, then considerable thought ought to be given to the desirability of the direction in which such attitude change moves. Kidder and Aubertine(1972), for example, found that a social minorities game called GHETTO had a significant negative effect on participants. As a consequence of the gaming experience, players appeared to adopt a pessimistic outlook towards people in general. This finding, and others of a similar nature, indicate that the power of gaming-simulation as a catalyst for attitude change should be treated with caution.

Just as cognitive learning from gaming-simulation may be associated differentially with certain player characteristics, so may affective learning be related in similar ways. Livingston(1972) discovered that students who preferred to analyze objectively a gaming-simulation rather than to immerse themselves into an assigned role responded differently to gaming than did those students who became involved actively in their game roles. In similar fashion, Lee(1971) found pregame attitudes and personality variables to be associated with different player responses to the INTER-

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NATION SIMULATION. And still other researchers have reported that the relative fit between a player's own feelings about the issues addressed in a given gaming-simulation and the feelings assigned to him by way of his game role can have an impact on the effectiveness of the game for the player(Dukes and Seidner, 1973). Again, however, the research base for such observations was found to be thin, and additional inquiry appeared to be warranted.

In summary, this aspect of the literature search revealed two important points about gaming-simulation and affective learning: 1) gaming-simulation experiences can result in attitudinal change in participants; and 2) affective outcomes from gaming-simulation may be related to certain player characteristics. The first point suggests that a great deal of thought on the part of game designers and users should be given to the consequences of attitude change in participants before gaming-simulation is employed as a teaching tool. The second point suggests, as was the case with cognitive learning, that pertinent player characteristics should be accounted for in gaming-simulation research design.

Motivation and Interest

Much of the gaming literature is devoted to discussions of the effectiveness of educational games as devices for engaging participants' interest in subject matter and then motivating them to learn more(Taylor and Walford, 1972). The nature of most discussions, however, is decidedly non-empirical(Greenblat, 1975). Consequently, although the commentary is favorable to gaming, its research basis

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is weak. Some empirical inquiries have been attempted in this area, nevertheless. Lee and O'Leary(1971), for example, found that students who participated in the INTER-NATION SIMULATION viewed their class more positively as a learning experience. And Livingston (1973) discovered that the use of the CONSUMER game led to a decline in the absences of disadvantaged students from the classroom. Other studies, however, have resulted in contrary findings. Livingston and others(1973) found that participating in the political science game DEMOCRACY did not increase students' interest in the legislative process. Again, there is an inclination to suspect that the outcomes of such investigative efforts may depend heavily on the particular game being studied.

Several critics have pointed out flaws in claims about gaming's ability to gain player interest and to promote motivation for additional learning. Greenblat(1975) has noted, for example, that student interest in gaming-simulation may represent a Hawthorne effect. "If such were found to be the case, it would suggest use of simulations only until these 'novelty effects' wore off or diminished beyond some point." And Cohen(1962) has argued that researchers have not rigorously explored the possibility that those students who show an interest in gaming-simulation are the same students who express an interest in the subject matter in regular classroom routines, ". . .and hence that there is little net increase in interest in the subject."

In summary, this part of the literature search revealed a large amount of anecdotal evidence to support the claim that gaming-

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simulation is a particularly effective medium for attracting participant interest in a subject area, and then motivating the participant to learn more. The non-empirical nature of most reports, however, indicated that additional systematic verification would strengthen the claim.

Methodological Problems in Games Research

The literature review up to this point has highlighted claims made in print about the teaching efficacy of gaming-simulation. It is apparent from this review that no definitive statements can as yet be made concerning the effectiveness of gaming-simulation as a teaching tool. Not only is there little empirically based data to support the intuitions of game designers and users, but much of the research that has been done in this area has suffered from methodological shortcomings(Greenblat, 1975).

Attention has been given already to the inadequacies of many research approaches. As Greenblat(1975) has pointed out, "Many of the studies suffer from poor research design: 'after-only' tests which preclude measurement of change; lack of control groups even where the intention is to draw conclusions about the value of simulations compared to other techniques; failure to consider Hawthorne effects; and poor criteria for accepting or rejecting hypotheses. . . .Another problem in many studies relates to poor operationalizing of concepts. Frequently the multidimensionality of such concepts as 'interest' is not recognized; 'learning' is often treated as a 'yes' or 'no' thing; and little attention is paid to

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